Gas Journal

VOL. 308 113th YEAR LONDON, DECEMBER 27, 1961 No. 5130 PRICE 1/9

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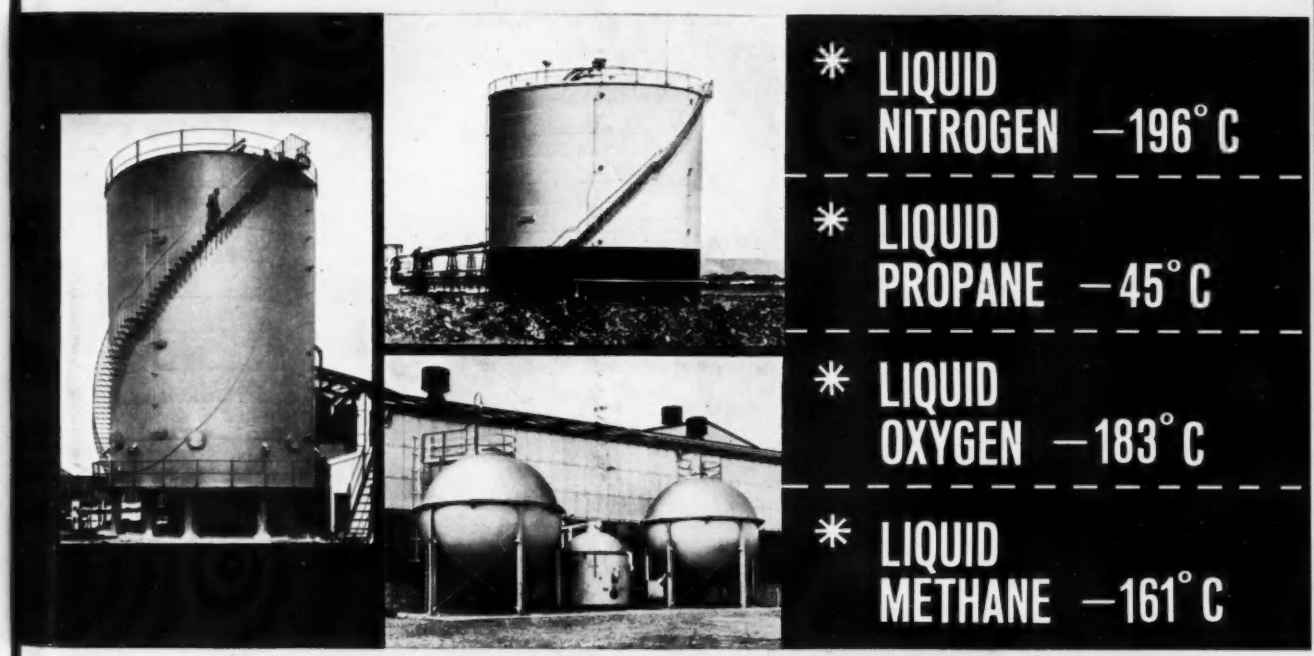

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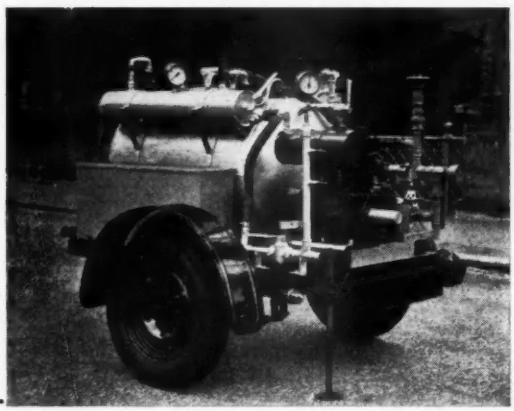
The 75-gallon vacuum and pressure trailer model Service Pipe Cleaning Outfit *(right)* is now fitted with the "PRESS-VAC" Assembly and cyclone and test-bar assembly. The "PRESS-VAC" assembly enables the operator to apply vacuum or pressure alternatively to the service pipe. This operation "rocks" the obstruction and assists in clearing the stoppage. The "PRESS-VAC" tank is pressurised by the exhauster from the main tank. This permits gas to be used for this pressure operation, thus avoiding the hazard of air entering the main. The cyclone and test-bar assembly enables the operator to make pressure tests before and after cleaning the service pipe, the test taps passing 50 cu. ft. or 100 cu. ft. as required. By using the cyclone the dust drawn from the service pipe is deposited in the sight glass for inspection and then into the easily removable container below. This enables the operator to determine the extent of the cleaning and prevents the greater part of the dust from entering the main tank. The "PRESS-VAC" assembly can be fitted to all existing service cleaning outfits.



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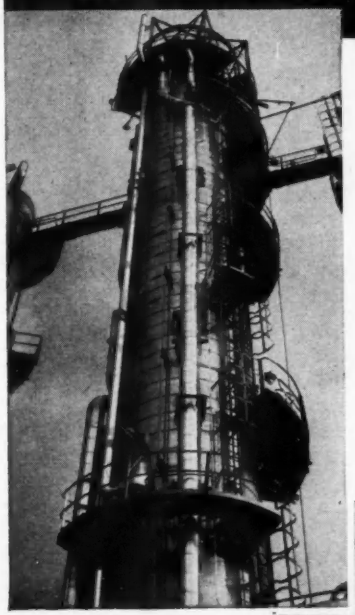
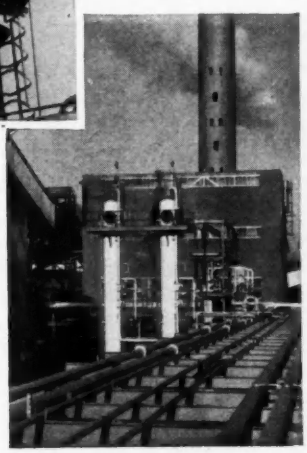


(Left) One of the 120ft. high regenerator vessels supplied by Babcock for the "Benfield" gas-purification plant at the Scottish Gas Board's "Lurgi" installation, Westfield, Fife.

(Below) The boiler-house, equipped with three 45,000 lb./hr. Babcock Bi-drum boilers with "Ignafluid" firing, and (centre) two benzol-absorber towers supplied by Babcock.

Main Contractors: Humphreys & Glasgow Ltd.



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Gas Journal

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WEDNESDAY, DECEMBER 27, 1961

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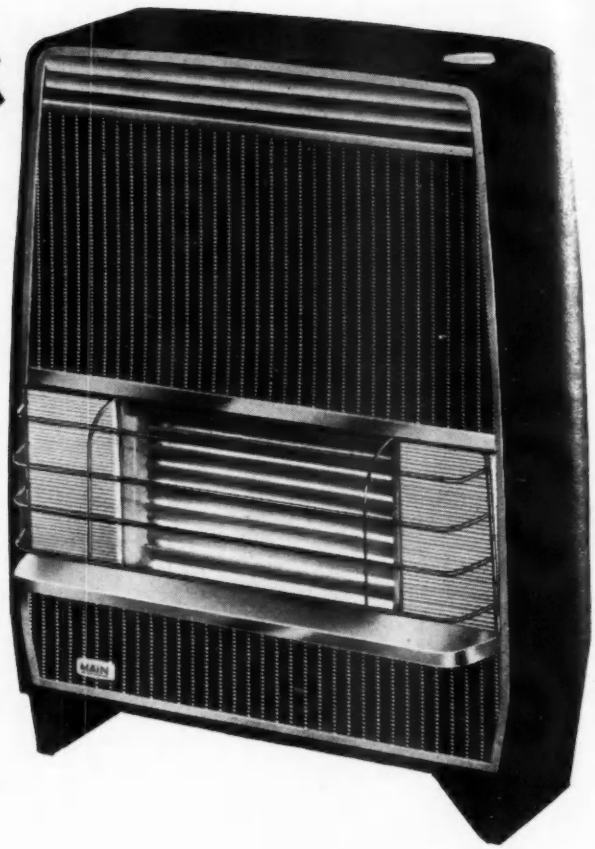

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Gas Journal

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Still far too many accidents

IT would seem that accidents, like the poor, are always with us, but in the more enlightened times of the mid-20th century, public opinion is unwilling to accept that either are entirely inevitable.

As a country becomes more industrialised, the chances of accidents occurring increase, and therefore the need to prevent them becomes a duty that all responsible people must be ready to assume.

Mr. B. J. Fuller, Area Safety Officer of the Eastern Board, in his paper to the recent research meeting of the Institution, which he has called 'The Safety of Employees: Some Avenues for Research,' may be said to lay down the first principles for accident prevention to be observed by management at all levels in industry.

It is, we feel, unfortunate but true that safety is not really a particularly interesting subject in its own right, except possibly for the far too rare enthusiast. Its exercise is not really the kind of thing that fires the imagination of the ambitious young engineer entering the industry intent on 'setting the Thames on fire,' but rather is it a problem to be grappled with since its neglect may well cost the industry a lot of money as well as much human suffering.

As Mr. Fuller points out, the gas industry unlike productive industry, is in very widely scattered units. It is not centred in neat compact factories where as many as 6,000 manual workers may be employed carrying out work that can be organised and easily directed. In such places a full safety organisation can be set up and every condition likely to cause an accident carefully studied, and the necessary changes made to create an accident-free and accident-conscious organisation.

The conditions in our own industry put a far greater responsibility on every level of management down to the works foreman to see that accidents cannot occur.

Mr. Fuller's picture of the number of accidents occurring throughout the gas industry is pessimistic if not alarming. Shown as the number of man-days lost expressed as a percentage of the man-days that can be worked in a year, the accident rate for male manual grades in the gas industry has in fact dropped to .41% in 1960-61 from .47% in 1953-54, but in actual numbers this represents 400 men away from work every day of the year, equivalent to the total manpower of a gasworks producing 30 mill. therms per annum. If this entire output was taken by domestic consumers, it would represent 290,000 such consumers living in a town as big as Liverpool.

The need for a thorough appreciation of the accident problem is clear, so also is a more scientific approach to its solution, and Mr. Fuller suggests certain lines of investigation. Among these there are four, which we think are of outstanding importance, viz., that most accidents can be prevented by establishing safe methods of work and safe places of employment, that a safety organisation specially suitable for the gas industry should be set up, that the methods of investigating and reporting accidents should be standardised, and that a detailed research should be scientifically carried out into the specific causes of accidents. This last suggestion may, we think, be perhaps the most important of all, since with all the ingenuity that can be exercised in the design of safe machines or the most suitable types of protective clothing, the basic cause of an accident may still escape detection.

The way the operative sets about his work, the positioning of his materials on a platform in the retort house, or the disposition of his tools, may all be potentially dangerous. We feel therefore that the present drive to the more economic use of manpower through the application of work study may go a long way to implant in the mind of the workman that his traditional methods are not necessarily the best or the safest.

Work study also has the additional advantage of providing monetary incentives, which, however, are unfortunately absent from all the exhortations to be safety-minded and accident-conscious.

WE WISH OUR READERS

A HAPPY AND PROSPEROUS NEW YEAR

Faulty finishes

CRITICISMS of the finishes on gas cookers are reported this month by the 'Woman's Viewpoint' contributor to *Gas Service*. With her usual sensitive ear for what the wild wives are saying she recounts the experiences of several ladies discussing the pros and cons of a consumer's protection council. Apparently gas cookers constituted only a part of a lengthy list of products found lacking in good workmanship, but the poor quality of their enamel finishes and chromium fittings came in for quite a barrage of criticism.

It was alleged that one new cooker had shed about half a dozen chips of enamel within three weeks of purchase. On a second cooker the chromium had rusted and, on complaint being made at the gas showroom, the customer was told that condensation in the kitchen damages chromium; her reply to that was she parked her car in the open for three years and there was not a spot of rust or corrosion on the chromium-plated parts. One woman said her husband had written to a newspaper about their gas cooker. The letter which had been published, complained that within minutes of the gas being turned on in a new cooker pieces of enamel from the hood of the eye-level grill began to chip off into the cooking food. It seems that the gas board concerned replaced the hood with a new one —that also chipped and so did a third one and a fourth one. *Then* the gas board invited the customer to visit the gas showroom to choose any other cooker he wanted.

As the *Gas Service* contributor pointed out, these types of complaint probably arise as a result of isolated lapses from customary high standards of workmanship and/or inspection. 'All the same they tend to give gas a bad name and handicap the salesmen in their work,' she writes. 'Successful trading by manufacturers and gas boards and the satisfaction of customers are interdependent. Gas boards must maintain a reliable reputation for the top quality standard of equipment on sales in their showrooms, and the manufacturers must play their part in keeping pace with competition by guaranteeing sound construction and reliable performance.'

Extensions for Brooklands

THERE was a time when mention of Brooklands conjured up a picture of Bentleys, Mercedes and Bugattis roaring round that famous but now defunct race track. Today the word has very different associations. Almost always it is taken to refer to the Brooklands County Technical College at Weybridge.

The college celebrated another landmark in its history on December 12 when important new extensions were opened by Viscount Knollys, the Chairman of Vickers Ltd., a company which itself has an historic link with the college since it occupied Brooklands House before that building became the nucleus of the Weybridge Technical College when it opened in 1949. The name Brooklands Technical College was adopted in 1957.

At this impressive ceremony, attended by a particularly distinguished gathering, one was conscious of the rapid growth of the establishment. When the college opened it had 118 part-time students; there are now more than 2,200. The four original departments—engineering, science, catering and women's subjects, and arts and commerce were increased to five by the formation, in 1956, of the department of management studies.

The new extensions include an assembly hall, new administrative offices, classrooms, laboratories and drawing offices, a training restaurant and various other specialist rooms, as well as extra dining facilities.

BRIEFLY . . .

Kiss of life

With sprigs of mistletoe recently in offices and factories everywhere you wouldn't think workers would need instruction in kissing. Yet that's exactly what many of them are getting. But it's a kiss with a difference—that life-saving 'Kiss of Life', or mouth-to-mouth resuscitation. A simple, pictorial guide to factory workers showing how to make 'the Kiss' is now being distributed to thousands of factories by the British Safety Council. The Safety Council poster features five sketches showing how to deal with victims of suffocation, gassing, electrocution and so on. The sketches are based on original drawings by one of Britain's leading experts on resuscitation, Dr. Wyndham Davies, but the lettering used is so gimmicky that it is practically unreadable.

Greetings and grates

Ten thousand householders in the Leeds Group of the North Eastern Gas Board have received 'Christmas cards' bearing an illustration of a homely hearth and an assurance that a bright and cheerful Christmas and New Year will be theirs if they use Cleanglow. The sales message has been kept as unobtrusive as possible, and to make the cards more plausible they were sent in unsealed, stamped envelopes which were addressed personally to each recipient. These were sent out early in December so that householders had time to order a supply of Cleanglow and have it delivered before Christmas. Apparently the basic idea of using a mailing effort on the lines of a Christmas card was suggested by the Coke Officer of Leeds Group, and developed by the Head Office Publicity Department. It is an idea which other boards may care to consider.

I.G.E. studies form

The news that the Institution of Gas Engineers is hoping to arrange an exhibition of paintings and drawings by members of the gas industry, to be held at the time of the A.G.M. in 1962, is welcome. If the idea catches on it might have a stimulating effect on the luncheon speeches; Munnings and John are, alas, no longer with us, but art still has its stormy petrels who would shine as guest speakers. Besides, the exhibition would give a new validity to any gas engineer liable to issue an invitation to see his etchings. Seriously, the idea *is* a good one, and anyone willing to exhibit—paintings and drawings in any medium would be welcomed and exhibited without competitive selection—is invited to communicate at once with Ralph Pollard, Lee Cottage, Weston Green, Thames Ditton, Surrey (Telephone: Emberbrook 6329). It would be helpful if they would state the number and sizes of works available. Whether sculptors of outsize statues will be permitted to use gas board transport is of course up to the board chairmen concerned.

General view of the 400,000-bbl. underground storage cavern, completed in granite at a depth of 420 ft. for the Sun Oil Company at Marcus Hook, Pennsylvania.

Mammoth man-made cavern for l.p.g. storage

WHAT is claimed to be the largest man-made cavern hewn out of solid granite in the world is now under construction at the Sun Oil Company's refinery at Marcus Hook.

The cavern is being excavated 420 ft. below the surface and will, when completed hold 400,000 barrels of butane, or 16.8 mill. U.S. gal. of liquefied petroleum gas.

The storage area is 2.244 mill. cu.ft. The shaft to the cavern storage is 42-in. diameter, and runs down 380 ft. to the cavern roof. The height of the cavern from floor to roof is approximately 40 ft.

The roof is supported by eight pillars, each approximately 40 ft. in diameter. The cavern covers an area of 53,428 sq.ft. The free floor area is about 1¼ acres, and the surface area used is less than ¼ acre.

Over 200,000 lb. of high explosives were used to shatter the granite in excavating. It took 13 months from completion of shaft to excavate the cavern, during which time over 200,000 tons of granite were removed from the cavern.

The cavern will be ready for filling on April 1, 1962.

It will have cost less than 3 mill. dollars, approximately seven dollars per barrel capacity. As a comparison, surface area that would be required for above-ground storage of a similar quantity is estimated at from 25 to 30 acres.

Surface storage would require the use of 500 to 600 pressure tanks. The cost for above-ground pressure storage for propane runs from 40 dollars to 50 dollars per bbl.

Of the 33 mined storage caverns in the United States the Sun Oil Company owns 14. Sun Oil has five caverns in salt formation at Inkster, Michigan, with a storage capacity of 500,000 U.S. bbl.; six caverns in salt formation at Sarnia, Ontario, with a capacity of 900,000 Imp. bbl.; three at Marcus Hook, Pennsylvania, on the property of the Sun Oil Refinery. (These three are in granite, Cavern No. 1, capacity 250,000 bbl., in operation; Cavern No. 2, capacity 400,000 bbl., under construction; Cavern No. 3, capacity 250,000 bbl., under construction).

By Hugh G. Jarman

Sun Oil Company engineers say that the advantage of underground storage is safety even against a hydrogen bomb explosion, lower maintenance costs, and lower construction costs, *i.e.*, about 15% of the cost of above-ground pressure storage for propane; and approximately 40% for butane.

With the world in a turmoil, it is logical that gas and

petroleum men are seeking ways and means of protecting their products as much as possible, against weather, fire, explosion and enemy attack.

Sun Oil Company were no exception to the rule. They have today over 2 mill. bbl. in underground storage—nearly 1 mill. at Sarnia, Ontario, Canada. This cavern will never be completed, as Sun Oil Ltd. simply pump in more water, dissolve the salt, pump it out and continue to enlarge their cavern as required.

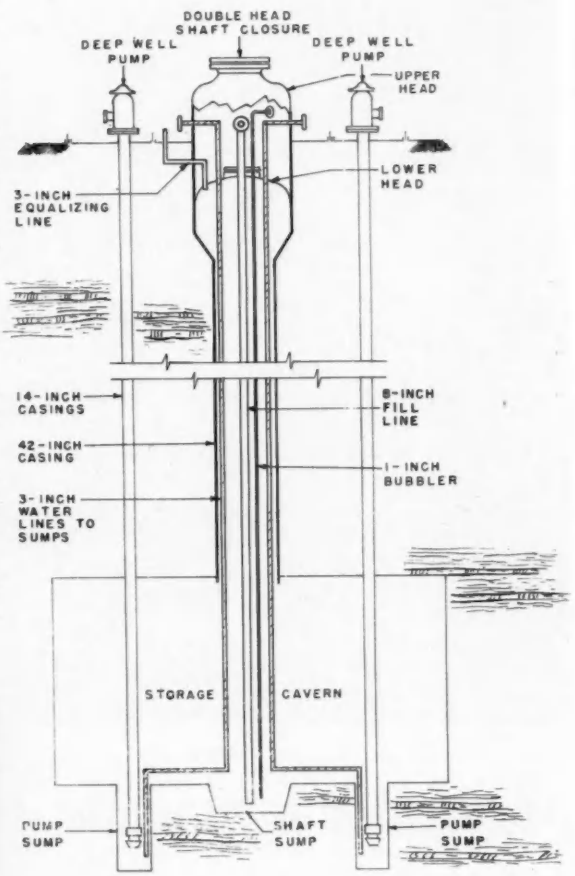
However, let us consider the details of the tremendous Marcus Hook Undertaking. As mentioned previously Sun Oil Company has three hewn caverns here—Cavern No. 1 250,000 bbl. started in 1957, is now in full storage; Cavern No. 2, with 400,000 bbl. storage, will be filled April 1, 1962; Cavern No. 3 of 250,000 bbl. capacity, a short time later.

Cavern No. 1 is 300 ft. below the surface; No. 2 is 420 ft. below the surface, and No. 3 is 350 ft. below the surface.

Construction started with the drilling of the 52-in. diameter shaft, the size being determined by the contractor, Fenix & Scisson Inc. It was large enough to permit the entry of men and machinery for work underground, and the removal of the granite.

The opening of the shaft was also small enough to permit effective sealing later against the pressure of the stored product.

Broken granite was hoisted to the surface in buckets with a capacity of 1·4 bbl. during excavation for the Sun Oil Granite cavern.



Sketch of piping and shaft closure for the Sun Oil Company's 400,000-bbl. propane cavern at Marcus Hook, Pa. The double head closure is prefabricated and welded, as a unit, to the 42-in. shaft casing. The 3-in. pump lines provide water to fill the pump sumps and 14-in. casing. This water provides a seal to permit removal of pumps for inspection and repairs. The 1-in. bubbler is used, in conjunction with the 3-in. equaliser line, to measure liquid level in the cavern. The 3-in. equaliser line also equalises pressure between the cavern and the surge tank. The 8-in. fill line extends within 2 ft. of the bottom of the shaft sump. All lines going into the cavern, with the exception of the 3-in. equalising line, have an automatic water seal if a break should occur above the lower pressure head.

The shaft was drilled by equipment comparable to a conventional oil or gas drilling rig, using a calyx-type drill. This drill, a revolving core barrel 50 in. in diameter and 20 ft. in length, used chilled steel shot as a cutting medium.

Cores were pulled loose from the formation by a special lifting device. These solid cores were from 10 to 20 ft. long.

Occasionally it was necessary to use a light dynamite charge at the bottom of the core to break it loose. The average drilling progress was eight to 10 ft. per eight-hour shift.

After the shaft was drilled to its full depth of 307 ft. the bottom 28 ft. was filled with sand. This sand supported

he bottom of the completed casing, and provided space for workmen to start excavating the cavern when it was later removed.

The steel casing, 42-in. in diameter, with walls $\frac{5}{8}$ in. thick, was installed in 20-ft. lengths. The bottom end of the first section of casing was plugged with five feet of concrete, and the shaft was filled with water. Because of the concrete plug, the entire steel casing could float, in spite of its great weight.

Each section was water-ballasted to a convenient height for the welding of the next section and the connecting of the exterior piping for grouting, power, and air-lines.

Tack-welded longitudinally to the outside of each section were two $1\frac{1}{2}$-in. pipes for use in the grouting process when the cavern neared completion.

Several other pipes, ranging from 1 in. to 2 in. in diameter, were also welded lengthwise to the outside of the casing to carry power and air lines. Four truck leaf springs were welded to the outside of each section, 90° apart as a centring device.

Pressure grouted into place

When the casing, lengthened by added sections, reached the sand plug at the bottom of the shaft, it was pressure grouted into place. Water was pumped from the casing, the casing de-watered, and a workman lowered to chip out the concrete plug with an air-jack hammer.

The sand plug at the bottom of the shaft was then removed, and a workman using a jack-hammer drilled diagonal blast holes around the side of the shaft, just below the steel casing.

When the sides of the shaft were dynamited, the broken rock fell into the base of the shaft. The hole around the shaft was widened by drilling and blasting until the rubble was level with the bottom of the enlarged opening. The rubble was then hauled to the surface in a mine bucket.

The proposed cavern outline, height, and pillar spacing, were designed in principle, in the drafting room before construction was begun. These designs were subject to change during the mining operation. At all times extreme flexibility of operations had to be maintained and permitted. This allowed the contractor to take full advantage of geologic irregularities that might occur, with resulting economies to the owner.

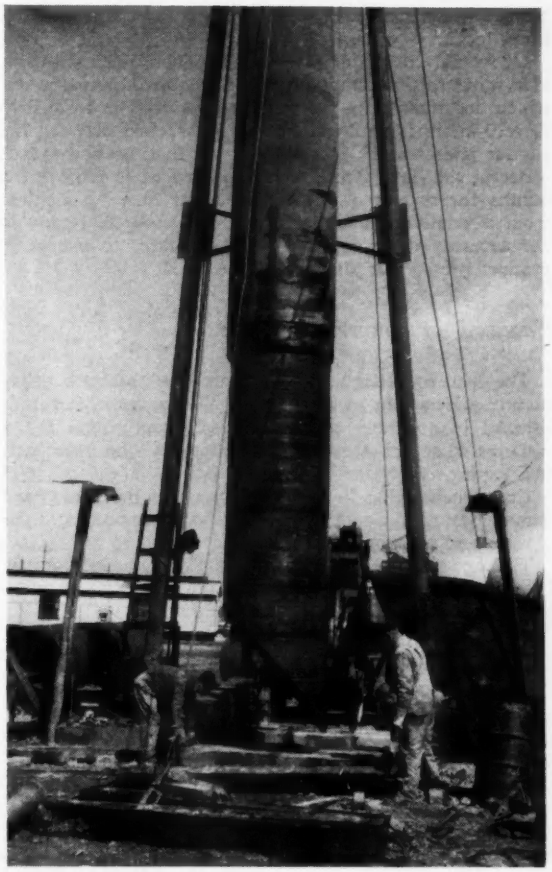
25-man crew

As the widened space permitted, additional workmen were used to continue drilling and dynamiting around the base of the shaft. Eventually a 25-man crew was able to dig out a series of drifts or tunnels.

Two 60-h.p., diesel-driven bulldozers, were lowered to the bottom of the shaft in sections and re-assembled in the cavern. These were used to push the rubble to the base of the shaft for removal.

Sun Oil's No. 1 cavern is a series of doughnut-shaped tunnels, 35-ft. wide and 37-ft. high. Seven pillars were left standing to support the roof, the smallest of these being approximately 40 ft. in diameter. The walls of the cavern have been left sheer and rough. As completed the cavern had a capacity of 250,000 bbl. and covers about one acre of underground area.

Sun's No. 2 cavern, now nearing completion, has a storage capacity of 400,000 bbl. and will be used for the storage of propane. The cavern floor is 420 ft. below surface. and No. 3 cavern, also under construction, has a depth of 350 ft. from ground surface, and will have a capacity of 250,000 bbl.



This is the special lifting device used to remove cores during drilling operations in connection with the preparation of the Sun Oil Company's vast underground gas storage area. The shaft to the cavern storage is 42-in. diameter and runs down 380 ft. to the cavern roof, which is approximately 40 ft. from the floor.

Although all excavation has been completed on the last two caverns the installation of above-ground piping and other equipment is now being done. No. 2 is scheduled to start filling April 1, 1962, and No. 3 will follow soon after.

A new shaft closure has been designed for No. 2 and No. 3. Sun engineers are incorporating a double-seal ring shaft closure as an additional safety feature. The double pressure head will eliminate all possibility of large-scale product leakage should extensive damage occur to the above-ground shaft seal.

This measure has been hailed by engineers as a significant contribution to the safety of underground storage caverns.

A sump has been dug in the floor of the cavern, directly beneath the shaft. The 8-in. fill line extends to within 2 ft. from the bottom of the sump.

This sump has a concrete bottom, and a manganese steel impingement plate under the fill line. It has a capacity of 8,000 gal., or about ten times the amount required to provide sufficient water to seal the fill line, should a break occur above the lower pressure head.

The end of the 1-in. nitrogen bubbler line is also sub-

merged in the shaft sump to provide a water seal should a break occur.

Of special interest are the 3-in. fill lines which will provide water to the pump sumps then required. Also, water which accumulates in the pump sumps will be forced up these 3-in. lines until equilibrium is reached between the vapour phase of the product and the hydrostatic head of water in the line. Thus, when it is desired to remove the pumps for repairs or inspection, water may be supplied from a relatively low-pressure (70-p.s.i) source, removing the necessity of using high-pressure pumps to overcome product pressure at the inlet valve.

Encased in concrete

The 3-in. equaliser line has, of necessity, no such safety feature. However, as it comes off the pressure head, it is encased in concrete, and is carried underground for a distance of several feet before it connects with other surface piping.

Consequently, if a break in this line or in the upper head should occur, it would be several feet distance from the closure and other piping.

The operation of the caverns of Sun Oil Company is of a very simple nature. A Christmas tree type of manifold with input and output water lines is used to inject and recover product from these caverns.

Sun Oil take light petroleum hydrocarbons under pressure directly from refinery units to storage, and with the use of deep well pumps for recovering the material.

No losses experienced

After approximately two years in No. 1 cavern, there have been no problems of any kind. Butane is metered in and out with turbine meters having an accuracy of plus or minus 0.05%, and no losses have been experienced.

In addition to the savings outlined previously, Sun Oil Company have made other economies. One example of additional cost saving is refrigeration. Certain petroleum products, such as l.p.g., revert to gaseous stages fairly easily and, in surface storage units, pressure must be maintained to keep them liquid. During the hot summers this problem is intensified and expensive refrigeration is required.

However, with underground storage, only one tenth of the pressure is required on the product and temperatures remain fairly constant, winter and summer.

This adds substantially to the reduction of storage costs. Marcus Hook caverns, have proved to be a good investment to the Sun Oil Company.

One of two diesel-driven bulldozers, lowered in sections to the bottom of the shaft and reassembled in the cavern, pushes rubble to the base of the shaft for removal in buckets.

GERMAN GAS PRODUCTION DEVELOPMENTS

ABOUT 85% of all gas produced in the German Federal Republic is by carbonisation of coal, but there are already 80 undertakings which have installed cracking or reforming plants for hydrocarbon oils, liquefied gas, refinery gas, natural gas or fuel oil. The total capacity of these installations in 1960 already amounted to 2.1 mill. cu.m. daily.

The output of natural gas increased in 1960 by 16% to 450 mill. cu.m. At the coke oven plants 380 mill. cu.m. gas were produced from hydrocarbon oils, or 3% of the total gas production. The municipal gas plants in 1960 made available nearly 450 mill. cu.m. of town gas from hydrocarbon oils, while the gas output of the refineries increased to 646,000 tons.

Engaging occasions

By W. H. Johnson

THE only honest conclusion I can come to about my earlier years is that I had a persuasive way of writing but I was repellent or otherwise unsatisfactory to meet in the flesh. It may very well be true nowadays, too, and it is not much consolation to recall that someone said of Oliver Goldsmith that he 'wrote like an angel, but talked like poor Poll.'

There is, however, considerable solace to be had in remembering some of the arisings from the regular perusal of the 'Sits. Vac.' columns of the gas Press. It introduced paid travel, meetings with people who have now achieved senior status, and short searching talks with those who were already among the Olympians.

My only assault upon the great Metropolis was made in the early '30s, while I was still an apprentice. I persuaded myself that London was the proper place to satisfy a great ambition, and wrote to mention this to the South Met.

A letter from one of the joint managing directors, inviting me to call, scared me a bit but I caught the night train from a remote part of Wales to keep the appointment.

It was bad planning. I met on the train a cheerful young man who whiled away the night drinking bottles of beer, and being a man of the world I kept him company.

Consequently, I burst upon a supremely indifferent London, which I knew as little as it knew me, at 6 a.m. in a crumpled, tired and far from bright condition. I cannot remember how I found Greenwich and all I recall of the interview was the question: 'Would you be prepared to work in the office?'. I answered that I was rather set on the works, or at least the labs., and there the matter rested—for ever. But my chief, when I reported faithfully, was wrathful at my choosiness.

A brief ambition

He may have been right, though a much better acquaintance with London has done nothing to bring back that one brief ambition to share its attractions for longer than a few days at a time.

It was during the next phase, as a chemist 'somewhere in Hampshire' that I travelled most widely and, I think, entertainingly. It seemed that there were three or four of us who managed to turn up at most of the interviews, and it became so regular that we used to look out for each other.

When we met at Spalding we were joined by a newcomer, who proved a rather costly acquisition. The interview was a curious and amateur affair, the candidate occupying the focal point of a concave assembly which must have been the whole town council.

They were all very courteous as I remember, except the man who asked questions, which he read from a paper like a prosecuting counsel going for a defence witness.

He was probably the town clerk, and he asked me what was the largest diameter main in my district. I was a chemist. I didn't know.

The newcomer must have had a blind spot too, for he joined the also rans, but to our surprise he was terribly upset about it. Spalding was, we had seen, a pleasant place, but not worth such grief when one was young and there were always new advertisements.

In the end we had to take our unhappy friend to a pub and restore him with spirits which we could ill afford.

Then it came out that this young aspirant had misjudged the position to the extent of wishing all his friends goodbye and giving notice to his landlady.

Benefit of the doubt

It was years before I saw him again doing something quite important in the Manchester area.

Expenses played quite a part in this game of musical chairs. It was accepted that we took the benefit of the doubt—we *might* for instance, have dinner on the train back. In the days when good books were cheap I made several useful additions to my library as mementos of these occasions.

But I never aspired to the lofty heights of the young man who said afterwards: 'I told them I wanted £10' when his real expenses were about half that. He might have been shooting us a line, or trying to impress our hosts. If the latter, his judgment was at fault on that occasion.

Experience and a little profit came from these excursions, and a rapid improvement in my knowledge of English geography and English railway systems. There were also some inconveniences, which at my present age I should regard with more misgiving. It seemed, for instance, that the train back from anywhere always reached London too late to catch the last Hampshire train.

I was a frequent dozer on Waterloo in the four seasons, and the worst of these nights was the one when the station was quite full, and everyone in the waiting room huddled together to keep at a distance from one ragged unclean sleeper. As he slept he scratched himself, continuously, hour after hour, with noisy vigour.

In a very different key, but again in the small hours, was the unforgettable and unrepeatable experience of seeing London by moonlight, in the early war days. Walking from Liverpool Street to Waterloo as a means of passing the night I came across the silhouette of St. Paul's, and stood to admire it.

As a result I spent the next few minutes trying to convince two earnest young policemen that I was not in any way sympathetic to Hitler.

At a later stage of the war, there was some hitch in the rail services into a main terminus, and we boarded special buses. I put on my tin hat, and then, in the queue, it came to me that I could easily injure someone by a careless head movement. So I took it off again.

I felt a bit of a fool standing there holding a tin hat and listening to the shrapnel falling like intermittent hail.

The most promising interview I had during the war came to nothing through no fault of my own. I had indicated that the most convenient train arrived somewhere in Shropshire—probably Shrewsbury or Wellington—at 6 a.m. and to my surprise the manager of the little group said he would meet me.

When I apologised for getting him out so early he said that he did not regard it as particularly early, and later in the day made it clear that he would expect me to drop in on the works fairly regularly at or before that ghastly hour just to keep people on their toes.

Having learned by that time the disadvantages of replying frankly and without due consideration, I was accepted.

A few days later, however, I heard from him that, if I were to arrive to take up the appointment I would be issued with call-up papers for certain; and in all probability would be tarred and feathered by the local population.

The manager was kind enough to add that, although he himself saw little point in my persevering, he left the decision with me.

To this day, in spite of my great admiration for many aspects of Shropshire, I still tend to look upon Salopians as a backward, if not barbaric, people, which is one more of the tragedies of war.

In fairness (to me) I should add that my applications to join both the army and the R.A.F. had been declined on the grounds of essential employment, and I objected in principle to being shanghaied by an official in a remote country district.

The difficulties peculiar to a war-based economy were responsible for what I thought was an injustice. I was bidden to the East coast, and by dark on the eve of the appointed date was stuck about 13 miles distant. Next morning I found that the advertised bus was not running, so I phoned to say that I should be late, and set off to walk. It came on to snow heavily, and after covering about half the distance I was offered a lift. My late arrival was not mentioned at the interview and I left, still damp, to pioneer a route home there to have influenza.

Year in the wilderness

A year or so later I met the same manager again, and he said quite casually that he would have appointed me without hesitation, but for the fact that he disliked unpunctuality. He must have thought that a year in the wilderness had purged my offence, for we spent several years together after that: years that were punctuated at intervals with similar unpredictable and usually uncomfortable judgments in an otherwise happy association.

For the first two or three years of looking around there was, along with the serious thought that any one of those letters could shape one's life, a more happy-go-lucky speculative element which is probably comparable with filling in a football coupon.

We were all, I am sure, quite serious candidates, and if successful would have put all we had, however little, into the new job. But with increasing experience of failures we developed a useful resistance to life's most common handout, disappointment, and to this extent we used those good people who arranged to interview us to further our education.

The immediate effect upon us—upon me, at any rate—was to foster confidence in discussion.

One never knew what sort of reception to expect from the company undertakings. It could be formal or informal o half of each: long or short: gay or serious.

Some people took the line that they would welcome a hand with the job, and wanted a competent sort of chap, and others were lugubriously eloquent about their burdens and their intention to secure the best man available, regardless of what it cost.

They usually paid the worst salaries, comparable only with those paid by municipal undertakings.

The pattern set by the latter was much more predictable, and almost always less enjoyable. It seems that any organisation spending public money, whether it be municipal or national, is dogged by a consciousness of sin. By going to considerable lengths to avoid graft or any opportunity for allegations of graft there were times when they did themselves a disservice.

The obvious choice

It is easy to think of half-a-dozen examples of appointments made over the head of the existing local man merely because everyone knew that he was the obviously suitable choice and might therefore be biased in his favour.

Add to that the democratic need to convince the local butcher or the postmen of one's technical ability, just because he was an elected member of the council, and one wonders why there was any competition for these posts. The fact that there was points either to compelling optimism or to the possibility that there were some good municipal employers, and you rarely know your luck till it is too late to draw back.

On the other hand there were some rigged—or shall I say pre-determined—appointments, the short-list was made just to keep the records straight, and one emerged wiser and, with luck, better off by the price of another book for the shelves.

The determination of salary level must have been to an extent disciplinary, considering the very small place taken by salaries in the balance sheet. But the gas industry has never shaken off its traditionally conservative attitude to this question, at least in the middle and lower ranks. The only excuse, that it was a sheltered industry, was tenable in the late twenties and the '30's, but those days are over.

Yet, within the last year, I was told by a board man that he had to find a man of quite extraordinary talent and experience to fill a certain post, 'because, after all, we're paying £1,500 a year.' As it happened, they were not. It was rising to £1,500.

But if this man and his colleagues had themselves had a wider experience they would have known that the man who embodied their ideals could command nearer £2,000 in the wider market.

We—that is to say, the members of the Short List Reunion Club—were amazed to find ourselves one day in the company of a thin pale youth who was too agitated and too busy to join in our conversation. His trembling fingers were turning over the pages of Alwyn Meade in the hope that he would be armed against whatever—he doubtless thought—he would be asked.

Such a joyless outlook has probably brought its reward by this time. But one too rarely sees the names of any of the others, my erstwhile friends, in the gas news.

Two morals, indeed, depending upon whether you are sitting in an entrenched position within, or whether, from the outside, you are looking back on the last decades of the luck-of-the-draw method of staffing, and the foot-loose optimists who cast their lots into the pool.

1961 CONGRESS

ASSOCIATION TECHNIQUE DE L'INDUSTRIE DU GAZ EN FRANCE

Liquefaction of natural gas

By L. RICHARD and M. BIAIS

GAZ DE FRANCE has studied the problems associated with the sea transport of natural gas in liquefied form at −160° C. and atmospheric pressure since 1954. An important step in the acquisition of knowledge in these matters was the erection of the experimental station for liquefaction of natural gas and for storage and re-gasification of liquid methane at Nantes, which started work in July, 1960.

The capacity of the liquefaction plant is 353,000 cu.ft. of gas in 24 hours, corresponding to approximately 3,740 gal. of liquid. The storage capacity is 110,000 gal. corresponding to 10.24 mill. cu.ft. of gas.

The principal objects of study at the station are:

(a) On storage reservoir questions: The behaviour of the metal (9.5% Ni-steel and aluminium-magnesium alloy), thermal stresses, heat insulation, temperature control and safety devices;

(b) plant for the re-gasification of liquid methane under pressure;

(c) equipment for very low temperatures (centrifugal pumps, heat-insulated pipework, valves, expansion bellows, etc.);

(d) apparatus for measurement and control;

(e) the establishment of fundamentals on which the authorities can base any specific regulations for the handling of liquefied natural gas.

In the near future, the Methane Transport Co. will be able, in conjunction with the Association of French Shipyards, to carry out sea trials with various types of tanks, heat insulation, pumps and safety devices on board an experimental methane tanker. The store of 110,000 gal. of liquefied natural gas will be used for loading and unloading experiments at the quay of the Nantes gasworks, which has been suitably equipped for this work. Gaz de France has made all technical and economic preparations for the supply of 35,000 mill. cu.ft. of gas per year from Hassi R'Mel in the Sahara, via the port of Arzew which has been chosen as the port of departure and the ports of Le Havre and Antwerp which are to be the ports of reception in the first stage.

Study of gas supply systems by computer

By F. REGIS DE BREM

THE calculation of gas supply systems under variable load conditions involves equation with partial derivatives which cannot be integrated.

The author of this paper has designed a new electronic computer for such conditions by means of which problems of great variety relating to the behaviour of long-distance grids can be solved. The computer works extremely rapidly, since a phenomenon lasting 24 hours is shown on an oscillograph, which has been proved to possess an accuracy of .5%, in 1/50th of a second.

The main components of the computer, which is of the analogue type, are:

(a) The main panels on which up to 60 pipeline sections representing a total length of 2,200 miles can be simulated

by electrical resistances and capacitances;

(b) the current generators which can send out sinusoidal, rectangular or polygonal signals and serve as analogues for a variable flow rate of gas;

(c) the control panel with a two-curve oscillograph with 7-in. screen, on which the results are read off.

The readings of the A.R.V. computer were found to be in agreement both with the results obtained by the mathematical method by means of Bessel functions and with results obtained from the analogue computer, Pace, of the European Calculation Centre in Brussels.

The A.R.V. computer has been in service at the No. 1 Test Research Centre of the Department for Study and New Techniques of Gaz de France, and is thought to be the only one in the world for the investigation of branch-line or ring-main gas supply systems with variable flow.

Metal compounds in Beynes gas

By C. DEGENT and C. LEBRAS

THE underground storage of coke-oven gas in a water-bearing geological structure, which was undertaken by Gaz de France in Beynes, near Versailles, was described in a paper by Delsol and Richard in 1957.

In 1958, one of the authors showed during the discussion of a paper which published the first operational results obtained at Beynes, that secondary chemical reactions took place in the reservoir which created iron carbonyl and nickel carbonyl, the presence of which initiates even in minute quantities the formation of carbon deposits on certain pilot burners on domestic gas appliances.

This research work indicated that the iron carbonyl was formed by the catalytic action of formic acid in the waters of the storage zone. The origin of this acid and the process of formation of a nickel reservoir are not yet completely understood.

Studies undertaken, both in the laboratory and in a pilot plant on the Beynes No. 19 shaft, have demonstrated that the use of activated carbon made it possible to remove the metal compounds from the gas on a commercial scale.

This operation is effective only if fairly strict conditions of dryness are observed as far as the gas itself (dew point approximately 5° C.) is concerned.

The regeneration of this adsorbing agent is entirely practicable. It consists of desorption of the metal carbonyls, with decomposition, by the application of steam, followed by very careful drying of the adsorbing charge.

The results obtained in the laboratory and in the pilot plant can be directly applied on the production level. By observation of the findings of these tests (contact time, volume of activated carbon, dew point of gas, elimination of traces of sulphuretted hydrogen, etc.), it became possible to extract during the 1960-61 winter at Beynes gas at a relatively high rate (over 56.5 mill. cu.ft. per day) without recording the slightest trouble which could be ascribed to metal carbonyls. Three appendices contain the detailed description of analytical methods of determination of the carbonyl traces.

Catalysts used in the gas industry

By Mme. VIGNES and M. COTTIN

THE various catalysts used in the gas industry were subjected by the authors to a number of tests which were intended to establish a card-index sheet with their physical, chemical and mechanical properties, and also to assess their activity.

In spite of the considerable differences in the chemical nature, carrier texture, nickel content and way in which the catalysts were prepared, a single test was established for which only a small test sample is needed.

Their catalytic activity, under strictly defined and reproducible working conditions, can now be compared, in face of the fairly difficult relation of reforming methane in presence of steam.

The apparatus which was used, and which is called 'Catatest,' is of simple design and is capable of continuous operation with external heating. The application of this test to a study of how the activity gradually changes as a function of the main characteristics of a series of 16 catalysts has produced the following results:—

(*a*) The efficiency is substantially proportional to the nickel content with an optimum at approx. 6% and maintained to approx. 9%. Above this percentage the efficiency drops;

(*b*) the activity is fairly well proportional to the porous volume of the catalyst, starting from a threshold of approx. 0.3 cu.in./oz. (0.18 $cm^3/g.$), below which the activity is very variable and often very poor;

(*c*) a relationship has been found between the activity and the percentage by volume of nickel which can be expressed by a bell-shaped curve, with an optimum value between 2 and 3. An optimum lying between 2.5 and 3.5 has also been found for the dispersion of nickel, expressed as the volume referred to the unit of surface area.

The examination of the changing activity of the catalysts under varying conditions has made it possible to define in detail the ideal conditions of use for each catalyst. A differentiation is also now possible between all-round catalysts and others which should only be used for a specific process.

Chromatography in vapour phase

By M. BOIVIN

CHROMATOGRAPHIC analysis in vapour phase is a technique which originated a few years ago and is now expanding rapidly in many various fields of application. Certain analyses which are of interest for the laboratories of the gas industry and offer particular difficulties, such as those of complex mixtures of hydrocarbons of low volatility, can now be carried out very quickly and satisfactorily by the so-called chromatographic analysis in vapour phase at high temperature.

By means of this method it becomes possible to determine on samples of very small size, i.e., a fraction of a cu.cm. in the case of a liquid, the composition of mixtures of several tens of constituents, with a relative accuracy of a few units per cent. in favourable cases, and in a very short time, which offers valuable possibilities in the field of control.

Chromatography enables the research worker to fractionate a mixture, with an effectiveness comparable with that of a practically unattainable distillation column which would contain several thousands of trays, on quantities of a substance from a gram to a gamma (10^{-6}g) depending on the types of detector and column in use.

It is not difficult to imagine that among the many problems of organic analysis arising in a department which has to deal with a great variety of samples collected in a gas undertaking, or for example, during the investigation of gas production processes on a laboratory or semi-commercial scale, there will be a great number for which chromatographic analysis in vapour phase at high temperature, in conjunction with spectroscopic test methods, furnishes the best possible method under present circumstances.

Interchangeability of gases

By F. GEBERT

THE methods for determining the interchangeability of gases which have been discovered and developed in France have been successfully applied in many other countries. The Ruhrgas Co. of Western Germany has also made extensive use of both these methods and of the test burner introduced by Delbourg and his collaborators.

During the tests of gases with greatly varying composition, some discrepancies were, however, found which led to a systematic investigation of the problem. The first step was the calculation of three gas mixtures, each containing only three constituents (either H_2, CO and CH_4, or H_2, CH_4 and N_2, or H_2, CH_4 and CO_2) for each of the ten points of the Delbourg interchangeability diagram.

The experimental investigation of these gas mixtures showed that the mixtures corresponding to the same point have the same test burner index and require the same burner setting for flames of a certain blue cone height. These mixtures were, however, found to have greatly differing heat outputs for the same corrected Wobbe index, because their Wobbe indices differed before correction by up to 20%.

Tests of mixtures with the same Wobbe index and the same combustion potential revealed that the agreement between the test burner indices, etc., observed after correction of the Wobbe index, did not exist any more. This appears to indicate that this method of determining the interchangeability of gas can be applied only to a comparison of gases of the same origin or of similar composition because only then are the corrections to the Wobbe index approximately the same.

The differential between the gases to be compared can also be reduced if the gases are classified into groups. It is hoped that in time a more general method can be developed, but all that can be stated at present is that gases with the same corrected Wobbe index and the same combustion potential have a number of properties in common.

Natural gas injection in a blast furnace

By R. MALVAUX, J. A. CORDIER and J. REBOUL

TESTS have been carried out on the No. 3 blast furnace at the Boucau works, which has a hearth diameter of 10 ft., in order to establish the relative merits of natural gas injection, after a theoretical investigation had indicated that this appeared feasible.

The gas was introduced through $\frac{5}{8}$-in. bore tubes of heat-resistant steel, arranged co-axially in each of the six blast-furnace tuyeres. A 21/64-in. diameter nozzle was fitted to the end of each tube.

After preliminary experiments from November 25, 1959, until March 27, 1960, full-scale production runs started and continued from March 28 until June 26, 1960, with natural gas injection.

This was followed by comparative control runs with-

out gas injection from June 27 until July 31, 1960, then another transition period and another injection run from August 8 until September 11, 1960.

The tests have revealed that a saving of 16% in coke consumption and a rise in production of 14% can be achieved by this means. The temperature of the blast rose on an average by 260°C., and the quantity of natural gas injected amounted to 2,895 cu.ft. per ton of pig-iron.

The theoretical calculations had predicted a saving in coke of 15% to 18%. The rate of useful conversion of hydrogen (*i.e.*, the ratio indicating how much of the hydrogen injected with the natural gas is usefully converted into steam in the blast furnace during the reduction process of the ore) was 35%.

The regular operation of the furnace was not disturbed and the high quality of the pig-iron was maintained. It was found possible to correct hanging charges by an increased rate of gas injection and to obtain a temporary reheating of the molten iron by decreasing the rate.

The new technique is relatively simple and does not cost much to install, it requires no additional labour, and the production personnel become easily used to it.

Conversion of solid-fuel fired boilers to gas

By D. DELOGES

THE present-day equipment for the conversion of solid-fuel fired boilers to gas is relatively expensive and is composed of an assembly of various pieces. The Department for Study and New Techniques at Gaz de France has therefore investigated and developed standard conversion equipment for the most common types of boilers and for capacities from 24,000 to 240,000 B.t.u. per hour. This equipment can be adapted to suit the various types of gas distributed and is cheaper by approx. 50% than the material used at present. The original points of this equipment concern principally:—

(*a*) **The burner.**—This is of the blue-flame torch type, with a cup-shaped deflector mounted above it. As its form is telescopic, the flame outlet orifice can be adjusted to be central in furnaces of different depth.

In order to cover the full range of capacities required, three types of burners are provided which are of similar design, but of different capacity. Tests on a prototype have led to the development of an injector-mixer unit which is flash-back proof and meets the requirements of the approval regulations.

It can be made to suit either town gas, natural gas at a pressure of 8-in. w.g. or propane-air gas of 715 and 1,485 B.t.u. per cu.ft., simply by exchanging the injector.

(*b*) **The draught regulator with a reverse draught preventer.**—This, in conjunction with the cup-shaped deflector, has made it possible to achieve efficiencies of 77% without any internal baffles in the boiler. A shutter can be used to modify the efficiency. It has, however, not been found possible to evolve a standard design, and each of the 60 types of boilers will have to have its own type of regulator.

Of the two French manufacturers who make equipment based on these results, one has already received the official approval for a Chappée boiler and for an Ideal Standard boiler installation. Other French manufacturers have made use of the data obtained in these investigations to simplify their equipment.

Conversion to natural gas

By C. HUMBERT and H. BODARD

A SPECIAL conversion centre set up by Gaz de France about two years ago deals with the problems concerned with the conversion of domestic and industrial gas appliances from town gas to natural gas and carries out the necessary installation work.

The methods being applied to convert domestic gas equipment were changed to suit the improved efficiency of the officials carrying out the conversion work and the growing tendency to do most of the work required on site in the homes.

Industrial gas equipment offered much greater difficulties and exact surveys had to be made, six to nine months ahead of the conversion, of the actual appliances in use and of the technical and commercial factors involved. This survey was undertaken by Gaz de France, in co-operation with the manufacturers. This often raised detailed questions of fuel consumption and of throughput rate of the appliances.

As far as possible, the conversion centre uses prefabricated conversion elements and the following standard units are now available:—

(*a*) Components of prefabricated burners, consisting of injectors, air inlet distance pieces, connections, feeder heads, and slotted bank sections;

(*b*) complete prefabricated burners for water heaters and geysers, also strip-type banks of burners.

More use is being made of stabilised flames in the construction of pilot burners, Bunsen burners and burners for kettles. The conversion of blow-pipes for jewellers, dentists and glass-workers required a special investigation, and satisfactory units are now available.

Gaz de France is at present working on the compilation of a complete list in which the characteristics of the many different types of conversion components used are specified in detail so that the supply of spare parts and proper maintenance can be assured.

Technical developments

U.G.I. develops one-pipe meter

A METER employing the one-pipe principle has been put on the market by U.G.I. (Meters) Ltd. The meter, model D.05 size, has the inlet and outlet connections accommodated, coaxially, in a single union liner let into the top of the meter.

This idea originated in Germany a few years ago, and many thousands of one-pipe meters are now in use in most European countries. In this country, a small number have been fitted for test purposes.

At present the D.05 meter is available as a credit meter only, but a prepayment version is in course of preparation.

A pipe fitting with coaxial branch is supplied and installed by the gas board when the gas to the premises is being run, to unite the service pipe with its control cock to the installation pipe.

The surfaces of the coaxial branch are of the same shape and dimensions as those of the liner on the meter, but the centre port protrudes .006 in. to ensure that the inner seal is tightened before the outer when the joint is made.

Inlet gas enters the meter through the annular ring in the liner and leaves through the coaxial centre port. The liner also carries a specially-shaped gasket, and a 2-in. size nut for fitting the meter to the gas supply.

The installation of the meter can be carried out quickly, cheaply, and effectively. All that has to be done is to remove the protective plug from the liner and couple the meter to the pipe fitting with the union nut.

The one-pipe meter has the same overall performance as that of its traditional two-pipe counterpart. Its merits lie in the ease with which it may be fitted to cover a variety of installations, and the fact that it is free from pipe stress. With a one-pipe installation, any pipe stresses are taken on the pipe fitting alone. The finished installation is neat and robust. No supporting wall-bracket or shelf is required, and credit and prepayment meters are directly interchangeable.

This system permits the installation of a single meter, or a number of meters may be grouped together either in line or branching either side of a vertical supply pipe.—*U.G.I. (Meters) Ltd.*

Fire extinguishers

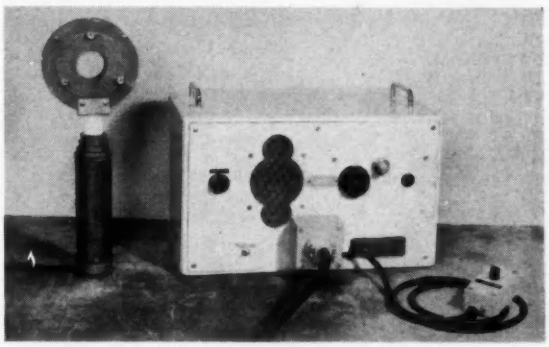
A NEW range of pressure-charge-operated fire extinguishers containing either chlorobromomethane or carbon tetrachloride with carbon dioxide added, and of greater fire fighting efficiency, has recently been introduced by Nu-Swift Ltd.

The new models are all approved by the Fire Officers' Committee, are made to British Standard 1721 and bear the Kite Mark of the British Standards Institution. The new Plus range of extinguishers will supersede the present Nu-Swift Auto extinguishers. Pressure charges for the old types of extinguishers will continue to be manufactured for present users for the next 10 years or longer.—*Nu-Swift, Ltd.*

Pin-hole detector

AN electronic pin-hole detector, suitable for inspecting insulating coating of metal pipes, either during manufacture or in the field, has recently been developed. The equipment comprises an electronic unit, suitable for operation from mains supply or battery, and a scanning head.

When the scanning head is moved by the operator along the pipe any fault or pin-hole in the insulated coating is



located by a non-lethal high voltage discharge, which gives an audible and illuminated signal on the control unit. The scanning head can be supplied with interchangeable or split rings to suit various sizes of pipe.—*Witton Electronics Ltd.*

Heavy-duty compressors

A NEW range of compact, heavy-duty, water-cooled, double-acting, cross-head-type, stationary air compressors, in which the cylinders are set 90° apart, has recently been introduced.

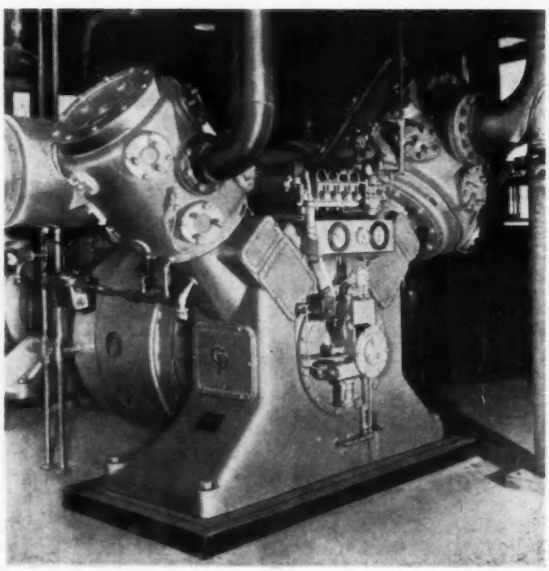
The new range, known as the Y class, is available in seven sizes with outputs of from 372 to 1,615 cu.ft. per minute at pressures of from 80 to 125 p.s.i. Multistage units are available for pressures of up to 3,000 p.s.i. The compressor can be driven by a flange-mounted motor, vee-belt drive or by a direct-coupled motor.

In these compressors, the ribbed and webbed frame is of high strength cast iron and is integral with the crankcase. Oil tight and dust proof inspection covers are fitted and each frame neck has a stuffing box with double metallic wiper rings to prevent egress of oil along the piston rods. The guides which accommodate the double acting crosshead, are also cast integral with the frame to give rigidity to the frame neck and to ensure a permanent alignment.

The crosshead end of each connecting rod carries a solid,

precision type bronze bushing, the crank pin end having a shim adjusted, bronze backed, babbitt lined split bearing secured by two alloy steel, heat treated bolts. The crossheads are one piece steel castings, faced with babbitt and grooved for lubrication. They overtravel the guides and this feature, combined with the large bearing area ensures that wear is held to a minimum and is evenly distributed The need for adjustable shoes which may give rise to loose operation or improper adjustment, is eliminated in this crosshead design by the use of a full floating alloy steel crosshead pin.

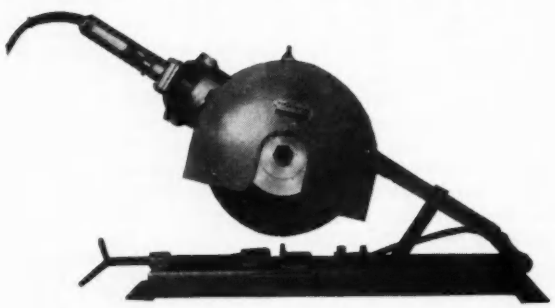
The cylinders of the Y range are of one piece construction, Meehanite being employed with a thickness which allows two reborings. The valves are disposed radially in each end of the cylinder barrel and the entire area of the



cylinder head is water jacketed. The piston is flat-faced and centre point lubrication is employed, giving equal distribution of the oil film over the wearing surface without the need for maintaining lubrication stuffing boxes or internal gaskets.—*Consolidated Pneumatic Tool Co., Ltd.*

Portable cut-off machine

A NEW lightweight portable cut-off machine has recently been put on the market. It weighs only 48 lb. complete, and will cut iron, steel, bronze. All motor bearings of the Black & Decker power unit are dust-sealed.



Fitted with a built-in swivel vice, the Portacutta will make 90° and mitre cuts, and has a quick release guard. It has a 1½ h.p. motor, operating at 6,000 r.p.m., which will cut angle iron, tube, steel strip, bar or conduit tube.—*Pee-Cee Engineering Supplies Ltd.*

Ball flow indicator

AN Arkon ball flow indicator of 1-in. size is now available. The body of the indicator is made of gunmetal and flow is indicated by the movement of a white nylon ball under a toughened glass dome.

The starting flow on liquid is ½ gal. per minute and on gas is 2 cu.ft. per minute. If the flow stops the ball drops out of sight.—*Walker Crossweller & Co. Ltd.*

New telemetry system

THE Dur-O-Pulse industrial data transmission system, is now available in this country. Designed for straightforward or up to 24-channel multiplex transmission over long distances, it is for gas, electricity, coal, water, chemical, petroleum, steel and other industries.

Of the pulse duration type, the system uses either a 10-second or 5-second cycle-time. It simultaneously carries process measurements and control signals up to 100 miles without repeater stations, by use of micro-wave, radio or power line carrier networks, or over a single pair of wires.

Basically the equipment comprises a power pack, indicator-transmitter and a recording receiver. The transmitter is a standard Honeywell indicating, controlling or recording instrument with an electronic scanning unit attached to the pointer; the receiver is a circular chart recorder. Among optional equipment are flow integrators and micro-switch or photocell alarm contacts.

Accuracy of the Dur-O-Pulse system is unaffected by transmission line variations, and it is plus or minus 1% of span for 10-second scanning cycles, and plus or minus 1.3% for 5-second scanning cycles. Calibration in the field can improve these figures respectively to plus or minus .5% and plus or minus .75% exclusive of the primary element.—*Honeywell Controls Ltd.*

Cathodic protection

A SYSTEM of cathodic protection has been evolved that provides a solution to the corrosion problem existing in the reservoirs of brewery pasteurisers. The Guardion applied current system, which has been evolved for this application, utilises silicon iron anodes energised by an air-cooled transformer rectifier. The system has proved successful in offering protection in the reservoirs to the area below the waterline.

The system has been developed using magnesium, zinc and aluminium sacrificial anodes. The system is adjustable to compensate for the breakdown of physical coatings.

The silicon iron anode used for this installation is manufactured under carefully-developed casting techniques with special regard to density and homogeneity; its uniform properties provide it with inherent corrosion resistance.

The silicon iron anode is provided with a cable connection sealed in at the factory, giving complete reliability.—*F. A. Hughes & Co. Ltd.*

NEWS SUPPLEMENT

Gas Council has signed methane import contracts

THE Gas Council has now signed contracts covering the purchase of natural gas from the Saharan field at Hassi R'Mel. No price has been revealed, says the Industrial correspondent of *The Financial Times*.

The announcement coincided with news from Paris that the French company, C.A.M.E.L., is now officially in being. It will buy the gas from the French producers, liquefy it at Port Arzew, near Oran, and then sell it to the transporters, British Methane.

The reserves of natural gas at Hassi R'Mel are estimated to total about 800,000 mill. cu.m., and the producers aim to step up output to about 25,000 mill. cu.m. a year.

M. Roger Truptil, chairman of C.A.M.E.L., said that the liquefaction plant at Port Arzew will be completed in 1963-64, and will be the first of its type and capacity in the world.

It will produce about 1,500 mill. cu.m. per year, in the first stage. The price at which the methane will be sold was not disclosed by M. Truptil, but it was considered sufficiently high to redeem the NF200 mill. investments on satisfactory terms.

Cost of the gas to C.A.M.E.L. at Port Arzew was put at 4.95 old francs per cu.m.

During inspection of Kennington holder station, left to right: Mr. W. K. Hutchison, Deputy Chairman of the Gas Council; Mr. W. E. Henshall, Metropolitan Division Gas Holder Stations Foreman; Mr. V. W. Stanton, Commercial Manager; Mr. W. E. Gibson, Chief Distribution Engineer; Mr. R. N. Bruce, Chairman of the South Eastern Gas Board; and Sir Henry Jones, Chairman of the Gas Council.

In the Central Service Centre, Suffolk House, Croydon. Mr. J. E. F. Swan (right), Computer Programmer, discusses the new 555 Computer with Mr. W. K. Hutchison, Deputy Chairman of the Gas Council (centre) and Mr. R. H. Sandford Smith, Deputy Chairman of the South Eastern Gas Board.

Gas Council heads visit S. Eastern establishments

THE Chairman of the Gas Council, Sir Henry Jones, and Mr. W. K. Hutchison, Deputy Chairman, have recently visited various establishments of the South Eastern Gas Board.

At Kennington holder station they inspected the new booster and governor installation and associated control room.

Later they visited the Croydon District office. They also toured the Central Service office at Croydon and inspected the 555 Computer, which is working on customer billing.

After this they toured the new Area Training Centre at Old Kent Road—looking in on courses for apprentices, gasfitters, home service advisers and salesmen.

They were accompanied by the Board's Chairman, Mr. R. N. Bruce, the Deputy Chairman, Mr. R. H. Sandford Smith, and chief officers of the Board.

Gas board wages grab is foiled

THE chances of 'Chicago-style' shooting battles developing in Britain have been discussed by leading security firms in London after a bank guard fired on raiders attempting in Mile End a theft of £125,000 wages being sent to the North Thames Gas Board.

The Daily Telegraph reports that the use of armed guards was criticised. The guard fired five shots with a .22 revolver, wounding one raider.

Mr. Eric Faulkner, a director of Glynn Mills Ltd., the bankers, is reported as having said: 'We are fully aware of the risks. Next time we may get two of them.'

The gang had planned to blind the guards with a mixture of Cayenne pepper and talcum powder, fired from a home-made mortar.

The ambush, one of the most carefully planned on record. started shortly before 9.30 a.m. The armoured car had collected cash for North Thames Gas Board employees. The thieves picked their ambush spot only a few yards from the main entrance to Bow Common Lane gasworks in Turners Road.

A national rescue competition?

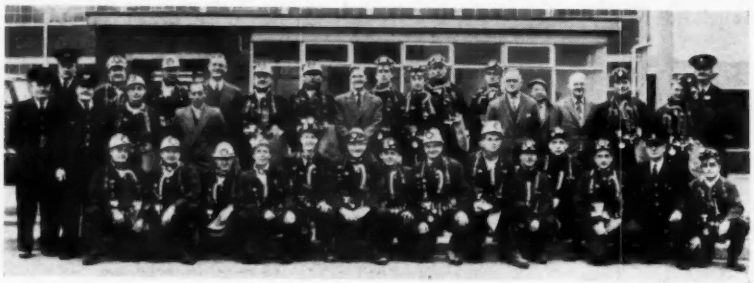
A SUGGESTION that next year there could be an inter-area rescue competition and that this could perhaps be the forerunner of a national competition, was made at the West Midlands Gas Board's rescue competition, held at Walsall works in November.

The event has been organised annually in addition to a first-aid competition. This year the safety officers of six other area boards attended as special guests. They represented the North Western, East Midlands, Southern, Eastern, North Thames and South Western Gas Boards.

The rescue team from Hereford District, representing Worcestershire and Herefordshire Division, won the contest with a total of 263 points out of a possible 400. Six divisional teams competed.

Mr. J. B. Cronin, the Board's Safety Officer, said at the prize presentation: 'This year for the first time we had representatives from other boards who came to see what we do. My intention was that perhaps in the not too distant future we could have some area competition on a national basis—as we do in first aid.'

Members of the six divisional rescue teams which competed recently in the West Midlands Gas Board's annual rescue trophy competition, with (extreme left) the three rescue, fire and ambulance superintendents who were stewards for the contest.



'ADMIRABLE'

The Board Chairman, Mr. C. Harold Leach, took up the suggestion and said: 'Let me say that if other boards want to have a go at us they are very welcome. I shall be charmed to be host to a competition such as you envisage, and if it grows to become a national competition, so much the better.'

He said that he thought the idea of a yearly rescue competition was 'absolutely admirable.'

Mr. Leach added: 'If we can make a success of an inter-area competition I will undertake to press with the Gas Council the idea of a national competition.'

The teams who competed for the rescue trophy were told by the judges: 'We were very pleased indeed with the high standard which you have achieved; we sincerely mean that.'

GAS WOOS CITY HEADS IN LEEDS

A MOVE has been made in Leeds to try to persuade the Corporation to introduce gas as well as electricity to the multi-storey flats that are still to be erected in the city.

At the November meeting of the North Eastern Gas Consultative Council Alderman Sellers mentioned that Mr. Tilley, the Leeds Group Manager, had invited the whole of the City Council members and certain officials to see the gas installations put in the multi-storey flats at Bradford by the North Eastern Gas Board, and he announced that the invitation had been accepted by most of the council members and officials and that the visit would be made later in the week.

Twenty-five Leeds City Councillors visited Bradford subsequently and were impressed with what they saw in the flats in Hillside Villas.

Councillor Frank Stubley said later that what he had seen at Bradford made him feel that gas should be given a trial in two buildings in Leeds.

'The gas board says it can install gas at no higher capital cost than is involved in installing electric heating in flats and, if this is so, I am inclined to let them have a go', he added.

Councillor Stubley said that his own view was that space heating by gas provided a 'better atmosphere to relax in'. Space heating by electricity was 'a bit muggy and dry'.

Councillor George Murray, a Labour member, said he was certainly impressed by the gas system he had seen at Bradford. 'I think it might not be a bad idea to give it a trial in one or two multi-storey flats in Leeds.'

Smoke control at low level

THE Health Committee of Sowerby Bridge Urban Council proposes to introduce some control areas in the lower lying parts of the district—those 400 ft. above sea level and less.

At a special meeting of the Committee it was stated that the spring or summer of 1963 would be the earliest date for the operation of the first smoke control order.

Flavel setback but confidence for future

A NET loss of £105,815 for the year to July 31, 1961, has been announced by Sidney Flavel & Co. Ltd., gas appliance manufacturers, engineers and ironfounders, of Leamington Spa, Warwickshire.

In consequence of this result, the board is unable to recommend the payment of a dividend, says the Chairman, Mr. T. C. L. Westbrook, in the Company's annual report.

However, he tells shareholders: 'The group is now operating at profitable levels, and your board views the future with confidence.'

Flavel's new gas room heater, the Debonair, which went into bulk production this autumn 'has been enthusiastically received by consumers throughout the country,' says Mr. Westbrook, 'and as a result very substantial forward orders have been placed with us.'

He goes on: 'Our success in re-entering this important space heating market is very gratifying, and will benefit the Company in the current year.'

The board intends to 'continue the development of similar appliances of original design and performance.'

The Chairman reports that the Envoy automatic cooker, introduced in December, 1960, 'continues to sell well.' Production of the Equerry cooker, launched in March this year, has been increased to meet current demands.

Mr. Westbrook recalls that in his previous report he pointed out that the imposition of credit restrictions by the Government had produced a contraction in the sale of consumer durables which was proportionately far greater than on any other class of product.

'The effects of this contraction fell upon your Company with great severity.'

Gas integration main crosses Lowestoft harbour

THE final major stage in laying the integration main between Norwich and Lowestoft by the Eastern Gas Board has been completed satisfactorily. A 12-in. gas main has been laid under the inner harbour at Lowestoft. It was an all-day operation lasting until 10 p.m.

A 12-in. water main was laid with the gas main, the work being carried out jointly under the control of Mr. E. Williams, Norwich Divisional Engineer, Eastern Gas Board.

This was the Board's third underwater crossing in connection with this integration main, the two earlier ones having been under the River Waveney at Beccles and the River Yare at Norwich, by the Board's Cremorne Lane works site.

RIGHT RETAINED

The Lowestoft harbour crossing was made along a line where mains were first laid as long ago as 1864. These became disused and were abandoned about 1890. The Gas and Water Company, as it then was, retained the right to relay pipes along the route, and pockets or pits to accommodate the risers of any new mains were left in the North and South Quays when they were rebuilt by the former L.N.E.R.

Possible alternative routes across the water were surveyed, but none better was found, and the Lowestoft Water Company decided to exercise its right and lay a new water main at the same time as the Board laid this section of its new integration main.

The pipe assembly was 228 ft. long overall, with a right angled riser at one end and a 75° angled riser at the other, each being approximately 30 ft. long. The weight of the assembly was 22¼ tons.

BITUMEN-COATED

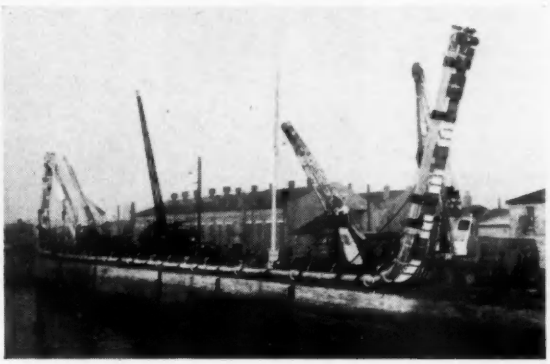
The water main was externally and internally coated with bitumen and had flanged joints, while the gas main was coated internally with red lead and had electrically welded sleeve joints. Both pipes were covered externally with woven glass reinforced sheathing, and the joints were covered with bitumen moulds.

To prevent damage during launching the pipes were covered with 1-in. elm laths.

At the time of the launching by crane, which hooked to five pick-up points welded to the pipes, 40 steel buoyancy drums were attached to the section.

It was towed up river and positioned horizontally over the dredged trench in the harbour bottom. The risers were loosely attached at either end, and a number of drums were removed until a neutral buoyancy was achieved.

READY FOR LAUNCHING



The assembled 12-in. gas and water mains hoisted into a vertical position ready for launching by crane from a wharf at Lowestoft Harbour. The water main has flanged joints. Note the buoyancy drums.

The mains floating horizontally in Lowestoft Harbour. The water main is visible; the gas main is submerged below the water main.

The assembly was then lifted into a vertical position and lowered into the trench 9 ft. below the harbour bed.

Divers descended on either side and unfortunately reported that the smooth operation of the work had been interrupted, for mud and gravel had fallen into the trench at one end and had prevented the pipes from bedding down properly.

BAGS OF CONCRETE

This necessitated re-dredging, and the work continued until about ten o'clock. With the mains finally settled on to their five beds of concrete bags, the dredger back-filled the trench, and the pipes were finally protected by covering the whole length of the crossing with bags of concrete.

The principal engineers engaged on the project were Mr. E. Williams, assisted by Mr. J. V. Knight, Divisional Mains Engineer, and Mr. W. D. Wilson, Assistant Mains Engineer, with Mr. K. B. Clarke, Chief Engineer of the Lowestoft Water Company, watching its interests.

The maximum help and co-operation was given by Mr. P. E. Bassham, Director, and Mr. C. W. English, Chief Engineer, of the civil engineers engaged, May, Gurney and Co., of Trowse, Norwich.

The British Transport Commission co-operated in carrying out dredging with the Lake Lothing.

COLONIAL GAS HOLDINGS

COLONIAL GAS HOLDINGS, LTD. made a net profit for the year ended June 30, 1961, of £207,881. Final dividends declared are 3% on Preferred stock (making 6% for the year) and 4% on Ordinary stock (making 8% for the year).

In spite of the abnormally mild winter in Melbourne and reduced industrial consumption in the latter half of the year, gas sales increased in volume by 2.3% as compared with 1960.

New gasfitting workshop opens at Southampton

IN co-operation with the Southern Gas Board, who have equipped it with about £1,000 worth of new appliances, a £3,500 gasfitting workshop was opened recently as an addition to the Southampton Technical College.

This is a development of the Board's scheme, planned in conjunction with local education authorities, for apprentices to spend their first year at full time education.

Mr. S. A. Finnis, O.B.E., Chairman of the College Governors, presided at the opening, which was performed by Mr. A. F. Hetherington, Chairman of the Southern Gas Board.

For the past year gasfitting apprentices, who had previously trained at the Board's Southampton gasworks' workshop, have been housed in the College plumbing department.

Mr. Maurice Glasspool is the full-time lecturer and there are four part-time instructors.

Those at the opening included Mr. F. T. West, M.B.E., College Principal; Alderman Frank Wood, Education Committee Chairman; Dr. J. J. Dempster, O.B.E., Chief Education Officer; Mr. A. F. Hetherington, Chairman of the Southern Gas Board; and Mr. D. L. Hill, Training and Education Officer, Southern Gas Board.

Apprentice fitter David Smith demonstrates thread cutting to, left to right, Mr. Maurice Glaspool, full-time lecturer at the gasfitting workshop; Mr. S. A. Finnis, Chairman of the College Governors; Mr. F. T. West, Principal of the College, Mr. D. L. Hill Training and Education Officer of the Southern Gas Board; Mr. A. F. Hetherington, Chairman, Southern Gas Board; Councillor M. W. Pettet, Vice-Chairman of the Board of College Governors, and apprentice fitter James Stagg.

100 gasholders since 1950

THE Hong Kong and China Gas Co. Ltd., of Hong Kong, has just ordered a Wiggins dry seal gasholder from the Power-Gas Corporation Ltd., of Stockton-on-Tees.,

This brings the total of orders won by Power-Gas for this particular type of gasholder up to 100 since they first began to manufacture them in 1950. The holder will be used for district storage in Hong Kong and will have a capacity of 1 mill. cu.ft. of town gas.

WIGGINS HOLDER

Gasholders of similar capacity are at present under construction by Power-Gas at the Clyde Ironworks of Colvilles Ltd. for the storage of coke oven gas and at the Rhondda works of the Wales Gas Board for the storage of town gas.

The Wiggins dry seal gasholder is made in any size from 50 cu.ft. to 5 mill. cu.ft. and is essentially a piston displacement gasholder in which the space between the piston and the gasholder shell is completely sealed by a synthetic rubber coated fabric seal.

Because it can be built on very light foundations and there are no moving parts which require maintenance, it is a particularly attractive holder from the point of view of cost, but its main attractions lie in the fact that it is unaffected by ice or snow, and a wide range of gases, even corrosive gases, can be stored without any risk of contamination.

NEW COMPANY IS LAUNCHED

LAUNCHED recently at a cocktail party at the Café Royal, London, Site Shotblasting & Painting Co. Ltd. of 37, Commercial Street, Birmingham 1, is composed of five firms, all well established for many years in their respective fields. They are a site shotblasting company, three painting contractors and a paint manufacturer.

The new company gives a complete service to marine and civil engineers and to industry for the cleaning and coating of metal surfaces on site. This is the first time that one company has possessed the resources to do such large-scale work from start to finish.

Teams of skilled men, working in self-contained units, operate from seven centres throughout the country as well as from the Birmingham headquarters. A total labour force of 2,000 is available for the work.

The constituent companies are: Shotblasting—R. J. Richardson & Sons Ltd., *37, Commercial Street, Birmingham 1.* Painting contractors: Abbott of Harrow Ltd., *23-25, Northolt Road, Harrow, Middlesex,* and *Hammonds Court, 22, London Road, Southampton;* Arnold Sharrocks Ltd., *229, Spotland Road, Rochdale,* and *6, Larch Lea, Liverpool 6;* and W. C. Simpson & Son Ltd., *Grosvenor House, 6, Grosvenor Gardens, Edinburgh, 12,* and *4-6, Lochy Crescent, Inverlochy, Fort William, Inverness-shire.* Paint manufacturer: John S. Craig & Co. Ltd., *12-40, Bogmore Road, Glasgow, S.W.1.*

THE INSTITUTION

and Junior Associations

WORKS VISIT

A PARTY from the London and Southern Junior Gas Association recently visited the East Greenwich works of the South Eastern Gas Board. This works was recently used as an illustration of development during the last ten years by Mr. C. H. Townsend in his Presidential Address to the Association.

The visitors were taken over the longer distances in personnel carriers, and the routing and timing of the whole visit was planned as an operation by the work study department. In this way a broad picture of the works was obtained.

BUTANE PLANT

Particular interest was shown in the instrumentation and automatic controls of the butane plant, and also in the control room.

Mr. C. H. Townsend said that it was fitting that in this, its Diamond Jubilee session, the Association should again visit Greenwich as it had done in both the Silver and Golden Jubilee sessions.

PERSONAL NOTES

MR. F. B. CROW, who has been associated with the gas industry for 55 years, is retiring. He started his apprenticeship at Ilford in 1906 under MR. A. A. JOHNSTON at Ilford gasworks. He then went to Brentford Gas Company, leaving the tar works at Southall gasworks in 1919 to join the Gas Light Improvement Co. Ltd. He left Pacific Wharf Refinery, as manager, in 1932 to start his own business manufacturing and applying Cromastic waterproofing products for the gas industry.

MR. R. C. INGRAM has been appointed to the newly-created post of Marketing Manager to George Kent Ltd. Mr. Ingram, who is 44, joined the Company as a student apprentice in 1934. The last ten years Mr. Ingram has been a technical sales representative, first for Yorkshire and then for Middlesex.

MR. G. H. HELLIWELL has been appointed Australian Manager, West's Gas Improvement Co. Ltd. MR. A. A. PETERSON has been appointed Assistant Australian Manager. The address of the Australian office of the Company is now 177, Pacific Highway, P.O. Box No. 477, North Sydney, New South Wales.

MR. A. CARR, Deputy Chairman and Assistant Managing Director of Thos. W. Ward Ltd., Albion Works, Sheffield, has been appointed Joint Managing Director of the Company.

ALDERMAN W. W. FARTHING, of Chelmsford, and COUNCILLOR LT.-CMDR. D. HARRISON, of St. Neots, have been appointed members of the Eastern Gas Consultative Council.

MR. J. HOLLAND, chief chemist at Bilston for the West Midlands Gas Board, has been appointed Chief Chemist to the New Zealand Gas Association.

MR. E. K. STEWART-SMITH, M.B.E., of Halstead, Essex, has been re-appointed a part-time member of the Eastern Gas Board.

ALDERMAN D. E. HAYTER, of New Milton, Hampshire, is to be a member of the Southern Gas Consultative Council.

COMING EVENTS

January 12. — SCOTTISH WESTERN JUNIORS: Industrial Section, 9, George Square, Glasgow. 'Industrial Relations,' by K. W. Moon. 6.30 p.m.

January 13. — YORKSHIRE JUNIORS: Wakefield. Short Paper Day.

January 15.—NORTH EASTERN G.C.C.

January 16.—I.G.E., LONDON AND SOUTHERN SECTION. 'The Marketing of Chemical By-products,' by C. E. Carey.

MR. H. M. LAWRENCE has been elected to the Court of the Worshipful Company of Carmen. This ancient Guild dates back to 1726, and Mr. Lawrence, who is a Freeman of the City of London, has been a liveryman since 1935 when he was transport manager of the former Gas Light and Coke Company. He is now Materials Handling, Transport and Coal Manager of the Southern Gas Board.

MR. T. C. BATTERSBY, M.B.E., Controller of the Tottenham and Watford Division of the Eastern Gas Board, is retiring in December, 1962. Mr. Battersby is this year's President of the Institution of Gas Engineers. MR. RICHARD WHITING, Ipswich Divisional General Manager, will become Divisional Manager of the Tottenham and Watford Division. MR. D. B. PARKINSON, M.B.E., Deputy Chief Engineer of the Board, will become Divisional Manager of Ipswich Division.

CORRESPONDENCE

Decimal coinage

Sir,

On page 387 of the issue of December 13 you made brief reference to anticipated difficulties in altering 7½ mill. prepayment gas meters to take a new decimal coinage.

There need be no difficulty. Examples of decimal coinages are the French and Swiss franc, the German mark, and the Dutch florin—ranging in value from 10 to 14 to the £—each divided into 100 cents or pennies—and each having a well-established relation to the dollar, which also is divided into 100 cents.

We, too, have a florin—10 to the £—and this could well be divided into 100 cents and so help to promote international understanding. Our £ would remain as it is, of 10 florins.

Our florin is the present 2s. piece. Our present shilling would simply be renamed 50 cents and our present sixpence as 25 cents. The present penny is 0.416 of the florin and could be revalued as either 5 cents or 10 cents, and the present halfpenny as 2.5 or 5 cents, as may be determined in accordance with current economic factors.

These values would be readily comparable with those of the decimal coinages of other nations. No change would be needed in the coins themselves apart from the inscription. No burden would be put on the Mint. No alteration in coin slot mechanisms would be needed except for the rather rare half-crown slot. Our present half-crown piece might be renamed as a double-florin or as a new crown-piece, for which a demand exists, without change in size.

Yours sincerely,
T. B. V. HIRST,
9 St. Andrew's Mansions
Dorset Street,
London W.1.

TRADE NOTES

VICKERS LTD. announce that they are completing negotiations for the acquisition of 60% of the equity in All Wheel Drive Ltd., of Camberley; the balance of the shares, 40%, will be held by Clark Equipment International. All Wheel Drive are manufacturers in the United Kingdom of the well-known Clark Michigan range of construction machinery, some of which may in the future be made by subsidiary and associated Companies in the Vickers Group. Vickers Ltd. announce also that, as from January 1, the Michigan range of construction equipment will be sold and serviced throughout all counties in England and Wales, with the exception of Northumberland, Cumberland, Westmorland and Durham, by Jack Olding & Co. Ltd., a member Company of the Vickers Group.

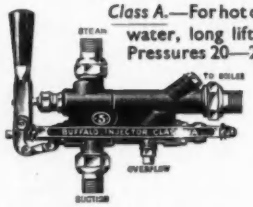
PLENTY AND SON LTD. have received record orders during the last six months for their Plenty gas filters. These filters incorporate the Pafic filter element, which is of moulded and cured glass fibre construction, and employs the principle of filtration in depth. Recently order have been received from the Wales Gas Board for a repeat of an earlier consignment, from the Scottish Gas Board for high- and low-pressure filters, and from the East Midlands and West Midlands Boards for standard filters. They have also been supplied to oil companies and a large consignment of high-pressure filters has been ordered by the Government of Quata for their high-pressure pipeline.

ROBERT DEMPSTER & SONS LTD. has recently introduced a new leaflet giving details of the company's rotary dividers. These machines are sturdily constructed and capable of reliable operation however abrasive or dirty the material being handled. The largest size is usually incorporated in the main material stream, while the smaller sizes, although capable of doing the same job, are most popular for laboratory analysis. All give speedy, accurate and representative sampling of coal, coke and granular materials.

THE COLONIAL GAS ASSOCIATION LTD. announces that the registered office of the Association, which acts as Registrar for Colonial Gas Holdings Ltd. in the United Kingdom, formerly at 12, Grand Avenue, Hove, 3, Sussex, has been removed to the following new address: St. Alphage House, Fore Street, London Wall, London, E.C.2.

PARKINSON COWAN INTERNATIONAL LTD. director, Mr. F. C. Crosse, Terminal House, Grosvenor Gardens, London, S.W.1, has just completed a successful seven-week tour of markets in the Far East, which has shown that considerable potential still awaits development.

BUFFALO INJECTOR



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APPOINTMENTS VACANT

GAS AND FUEL CORPORATION OF VICTORIA

APPLICATIONS returnable to the Secretary, Premier's Department. Melbourne, by 1st March, 1962, are invited for appointment to the office of Chairman of Directors of the Gas and Fuel Corporation of Victoria under the Gas and Fuel Corporation Act, 1958.

Subject to the provisions of the Articles of Association the appointee will be appointed for a period of five years. The appointee will also be required to accept appointment as Managing Director of the Gas and Fuel Corporation and the combined salary for the two offices will be £6,500 per annum (Australian).

The Corporation's activities include the production, distribution and sale of gas and by-products to approximately 360,000 consumers throughout the State of Victoria.

Its present investment approximates £40 million and it has a continuing programme of expansion.

The gas is produced in three major works from black coal, brown coal and petroleum products.

The Corporation carries out research and development work in connection with the production and utilisation of gas in homes and industries. The Corporation is also a major retailer of domestic and and industrial gas appliances. It distributes and sells liquefied petroleum gas throughout the State. direct and through agents and distributors.

Functions and scope of the Corporation are described in the Gas and Fuel Corporation Act, 1958.

Superannuation provisions will be a matter for negotiation.

The Application should include the following information:—

(a) Full name, address, date and place of birth and marital state.
(b) Present appointment and earliest date on which it could be relinquished.
(c) Qualifications.
(d) Details of other appointments and experience.
(e) Names and addresses of three referees.
(f) State of health.
(g) Any other relevant information.

Applicants should supply three typed copies of their application and one copy of a recent photograph.

A copy of the Gas and Fuel Corporation Act is available at the Office of the Agent-General for Victoria, or through any Australian Trade Commissioner.

If the appointee should come from outside Australia, he will be allowed travelling expenses for himself on the basis of first-class steamer fares and, if married, his family. He will also be allowed a sum not exceeding £400 (sterling) for freight on furniture, etc. If, for exceptional reasons, the cost of transport exceeds this allowance, the Corporation will consider a request for a supplementary allowance.

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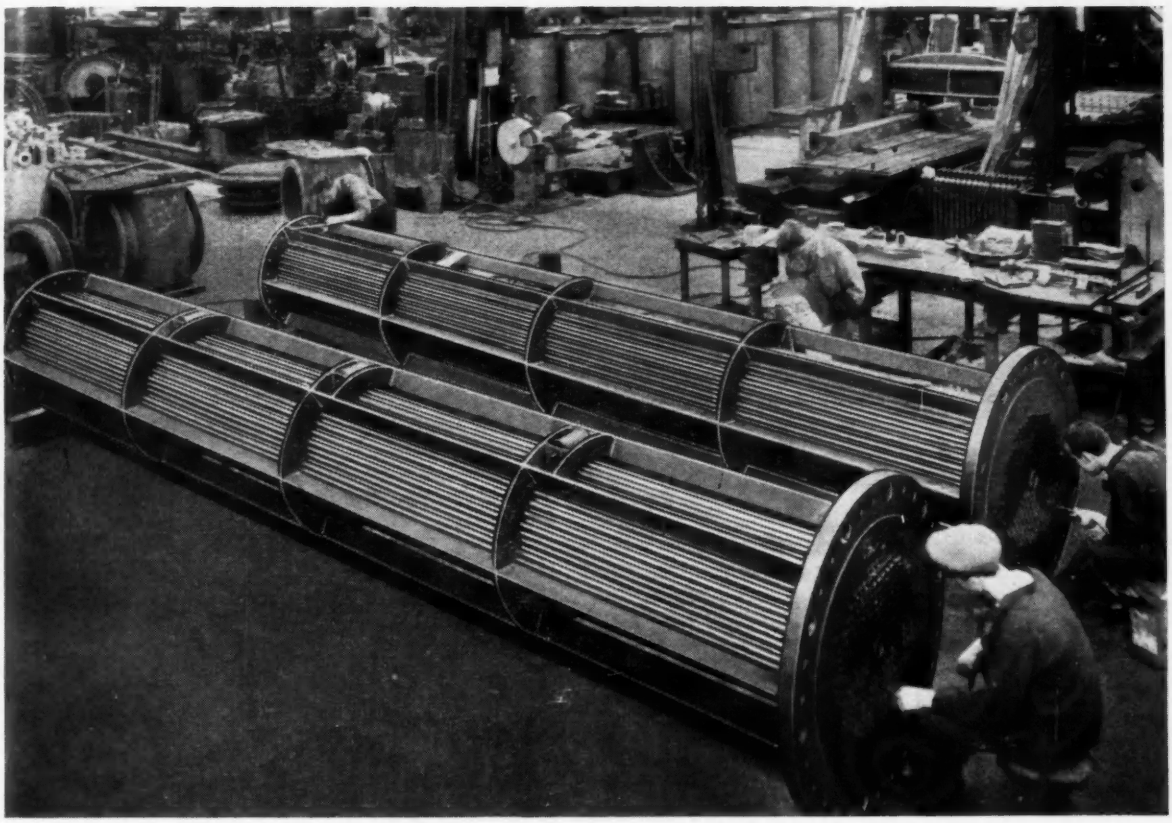

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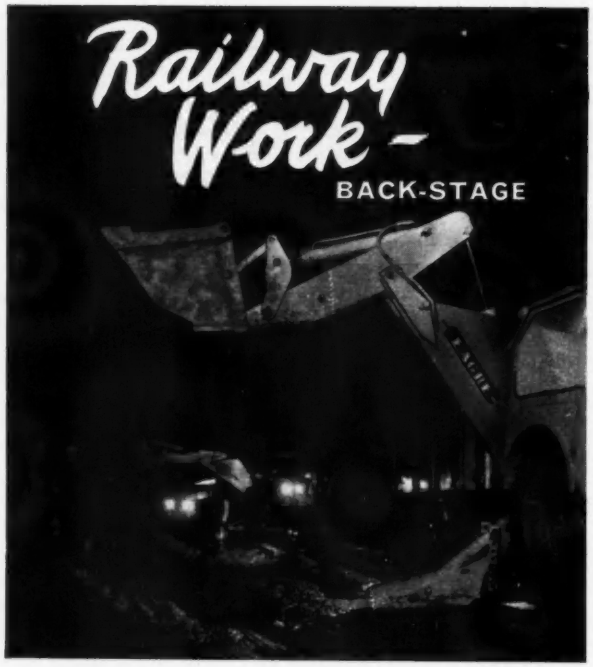

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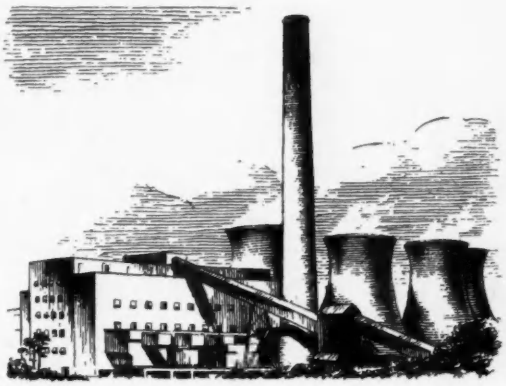

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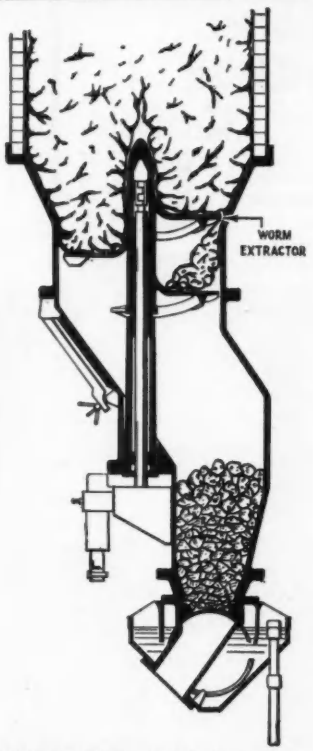

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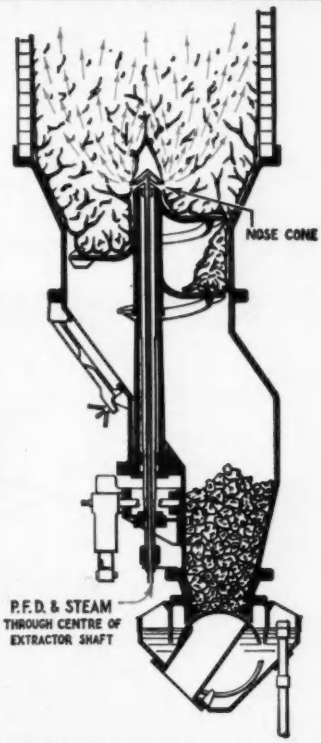

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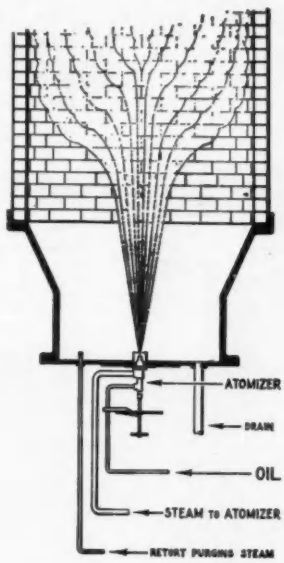

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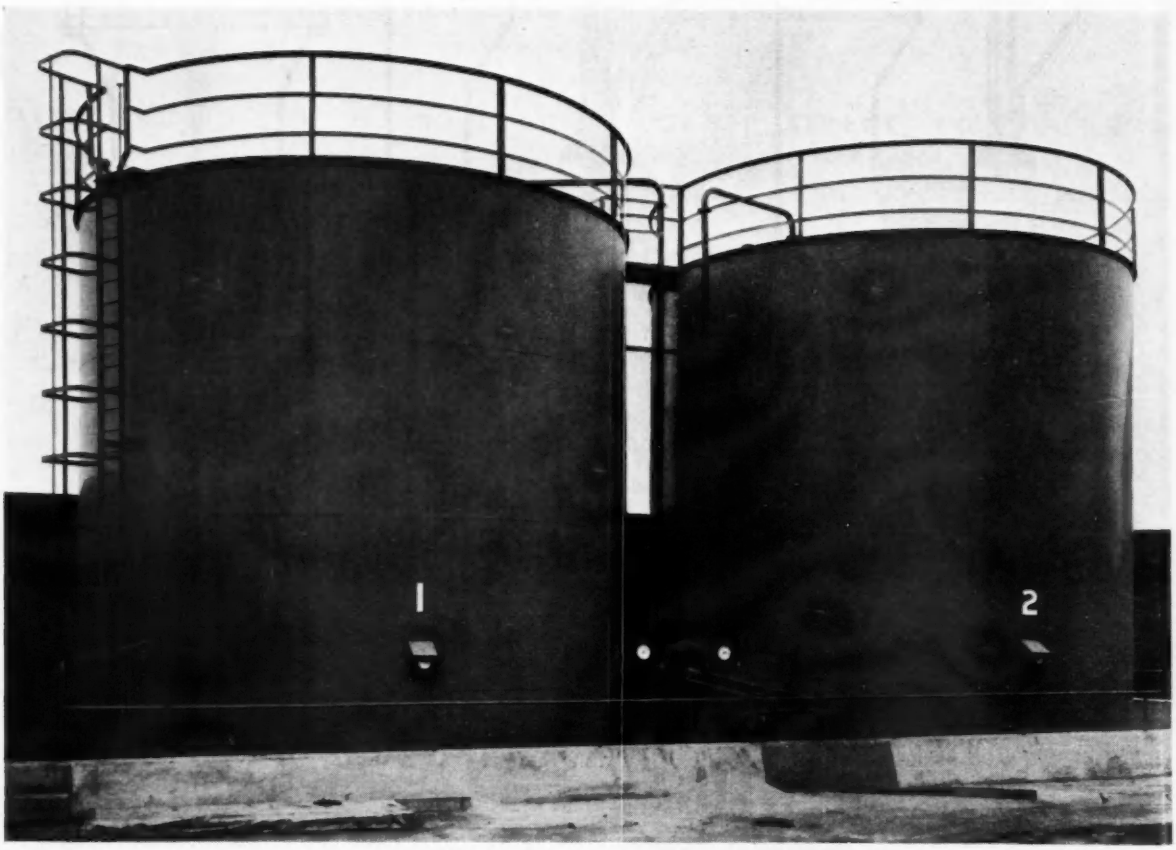

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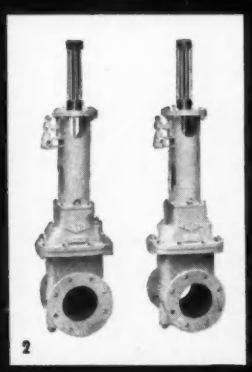

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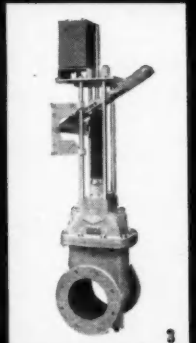

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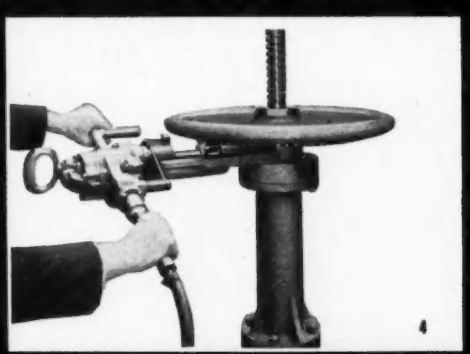

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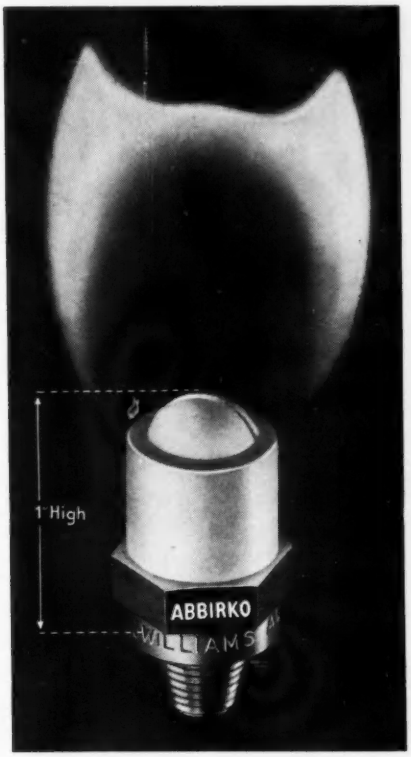

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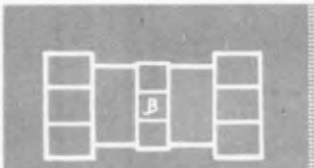

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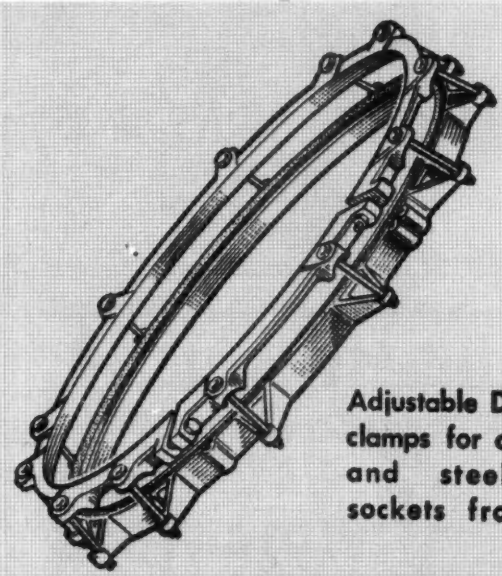

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